Global epidemiology and socioeconomic development correlates of the reproductive ratio of SARS-CoV-2

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Supplementary Materials

Supplemental Table S1. Regression models estimating the time trend of COVID-19 $\log(R_e)$ using the a priori selected time-lag of 21 days for controling for the effect of country-wide interventions as recorded by the Oxford COVID-19 Government Response Tracker.

Intervention	Estimated coefficient (95% confidence interval)			Fold-change in R_e for intervention
	Day	Day^2	Intervention	
None	-0.035 (-0.039 to -0.031)	0.00024 (0.00021 to 0.00028)	not applicable	not applicable
School closing (require closing of at least some levels or categories of schools)	-0.034 (-0.039 to -0.030)	0.00024 (0.00020 to 0.00027)	-0.051 (-0.094 to -0.008)	0,950
Workplace cosing (require closing for at least some sectors or categories of workers)	-0.035 (-0.039 to -0.030)	0.00024 (0.00020 to 0.00028)	-0.042 (-0.077 to -0.007)	0,959
Cancel public events (require cancelling)	-0.034 (-0.038 to -0.030)	0.00024 (0.00020 to 0.00027)	-0.073 (-0.116 to -0.029)	0,930
Restrictions on gatherings (restrictions on gatherings of 1000 people or stricter restrictions)	-0.034 (-0.038 to -0.030)	0.00024 (0.00020 to 0.00027)	-0.063 (-0.102 to -0.025)	0,939
Close public transport (require closing or prohibiting most citizens from using it)	-0.035 (-0.039 to -0.031)	0.00024 (0.00021 to 0.00028)	-0.014 (-0.064 to 0.037)	0,987
Stay at home requirements (require not leaving house with limited exceptions)	-0.035 (-0.039 to -0.030)	0.00024 (0.00020 to 0.00028)	-0.051 (-0.086 to -0.016)	0,951
Restrictions on internal movement in place	-0.035 (-0.039 to -0.031)	0.00024 (0.00021 to 0.00028)	-0.011 (-0.048 to 0.025)	0,989
Any of the interventions above	-0.034 (-0.038 to -0.030)	0.00023 (0.00020 to 0.00027)	-0.091 (-0.137 to -0.044)	0,913
Comprehensive contact tracing	-0.035 (-0.039 to -0.031)	0.00024 (0.00021 to 0.00028)	-0.047 (-0.102 to 0.007)	0,954
*Sensitivity models**				
None	-0.026 (-0.030 to -0.022)	0.00018 (0.00015 to 0.00022)	not applicable	not applicable
School closing	-0.025 (-0.029 to -0.021)	0.00018 (0.00014 to 0.00021)	-0.062 (-0.107 to -0.016)	0,940
Workplace closing	-0.025 (-0.029 to -0.021)	0.00018 (0.00014 to 0.00022)	-0.045 (-0.081 to -0.008)	0,956
Cancel public events	-0.025 (-0.029 to -0.021)	0.00017 (0.00014 to 0.00021)	-0.091 (-0.138 to -0.043)	0,913
Restrictions on gatherings	-0.025 (-0.029 to -0.021)	0.00018 (0.00014 to 0.00021)	-0.057 (-0.097 to -0.017)	0,945
Close public transport	-0.025 (-0.029 to -0.021)	0.00018 (0.00014 to 0.00022)	-0.045 (-0.097 to 0.006)	0,956
Stay at home	-0.025 (-0.029 to -0.021)	0.00018 (0.00014 to 0.00022)	-0.029 (-0.064 to 0.005)	0,971
Restrictions on movement	-0.026 (-0.030 to -0.022)	0.00018 (0.00015 to 0.00022)	0.010 (-0.025 to 0.046)	1,010
Any of the interventions above	-0.025 (-0.029 to -0.021)	0.00017 (0.00014 to 0.00021)	-0.099 (-0.149 to -0.048)	0,906
Comprehensive contact tracing	-0.026 (-0.030 to -0.022)	0.00018 (0.00015 to 0.00022)	0.022 (-0.034 to 0.078)	1,023

* For sensitivity analyses, the robustness criteria were defined as at least 2000 confirmed cases, at least 250 cases in the last week, and no drop to 100 cases per week or less.

Supplemental Table S2. Association of country-level development indicators with COVID-19 seven-day reproductive ratio (R_e) estimated in mixed linear regression models of log(Re) with country as random effect, adjusted for non-significant linear and cubic time-trends. The reported RR fold-change was calculated by exponentiating the regression coefficient of the highest versus lowest tertile of each indicator. Shown are the results of sensitivity analysis models including all data from the 14th or 42nd robust day on.

Development indicator	R_e fold-change (95% confidence interval)	R_e fold-change (95% confidence interval)
	from 14th robust day	*from 42nd robust day*
Gross domestic product per capita	0.97 (0.88-1.08)	0.89 (0.79-1.00)
Population density	1.00 (0.90-1.10)	0.92 (0.82-1.02)
Average household size	1.09 (0.98-1.21)	1.12 (1.10-1.38)
Median age	0.93 (0.83-1.03)	0.88 (0.78-0.99)
Proportion age >65 years	0.92 (0.83-1.02)	0.87 (0.78-0.98)
Life expectancy	0.93 (0.84-1.04)	0.87 (0.77-0.97)
Health expenditures (dollar per capita)	0.93 (0.84-1.03)	0.86 (0.76-0.97)
Physicians per population	0.93 (0.84-1.04)	0.89 (0.79-0.99)
Disability-adjusted life years lost due to any (rate)	1.01 (0.91-1.12)	1.06 (0.95-1.18)
Disability-adjusted life years lost due to communicable, maternal, neonatal, and nutritional disease (rate)	1.08 (0.98-1.20)	1.16 (1.04-1.30)
Disability-adjusted life years lost due to non-communicable disease (rate)	0.93 (0.84-1.03)	0.88 (0.79-0.98)
Total fertility rate	1.09 (0.98-1.20)	1.14 (1.02-1.28)
Extreme poverty prevalence	1.13 (1.00-1.29)	1.23 (1.06-1.43)
Child malnutrition prevalence	0.97 (0.86-1.11)	1.00 (0.85-1.17)
Under 5 mortality rate	1.05 (0.95-1.17)	1.13 (1.01-1.27)
Maternal mortality ratio	1.03 (0.93-1.14)	1.10 (0.98-1.24)
World Bank GINI coefficient	1.14 (1.03-1.27)	1.23 (1.10-1.38)

Supplemental Figure S1. Distribution of the empirical reproductive ratio (R_e) of COVID-19 in the first months of the pandemic in 174 countries by calendar date.
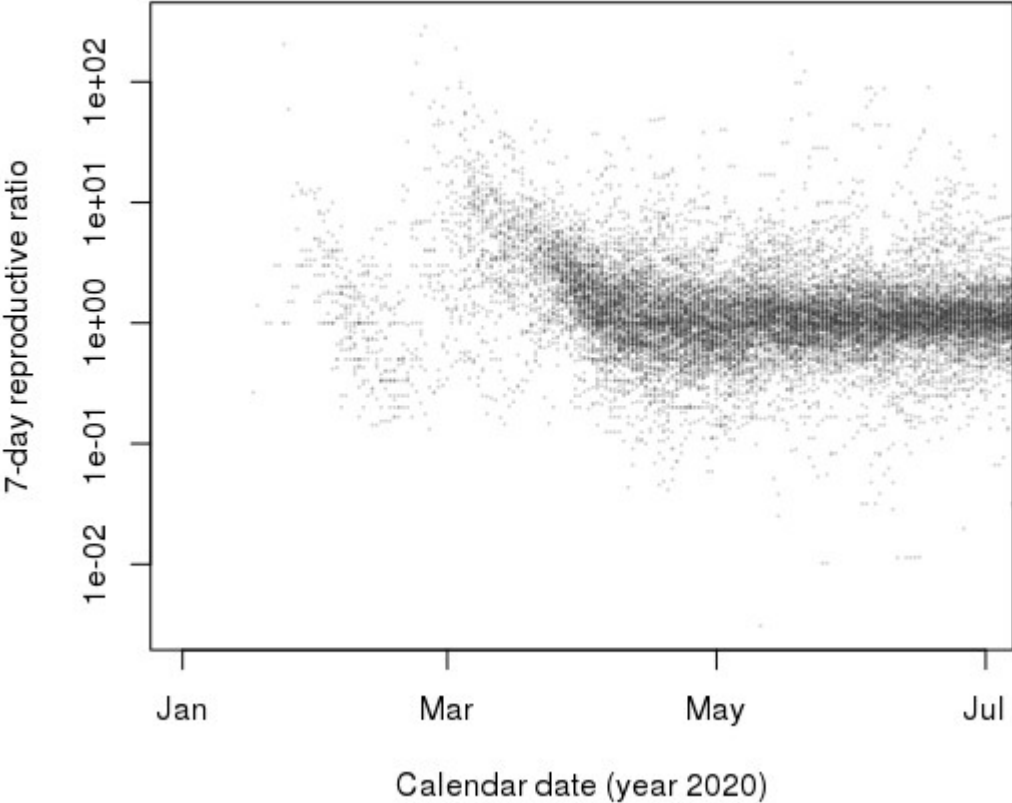
Supplemental Figure S2. P-values for the effect of country-wide physical distancing interventions or comprehensive contact tracing on the COVID-19 $\log(R_e)$ as estimated in mixed linear regression models, by intervention time lag. The triangle marks the 21 days lag a priori considered most plausible to allow for the times from infection to detection to reporting.
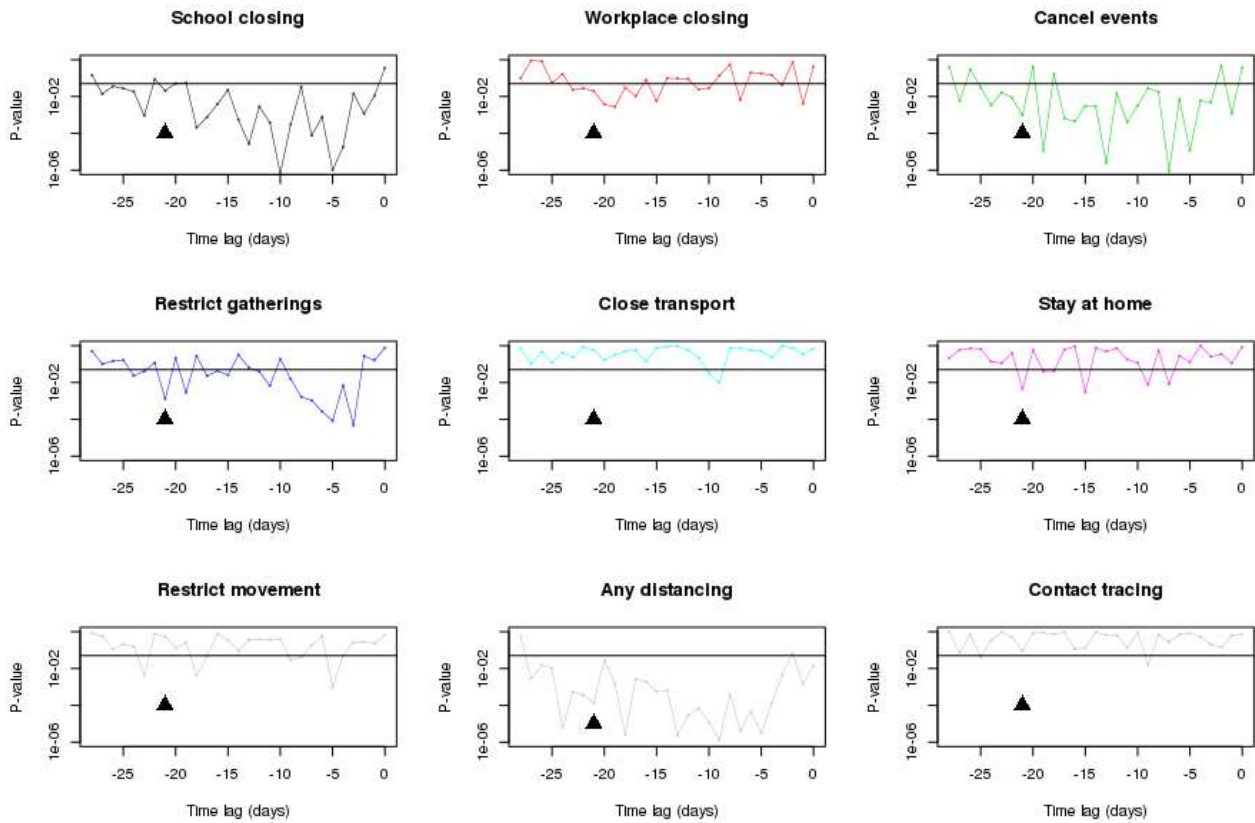
Supplemental Figure S3. Timing of the implementation of countrywide physical distancing interventions or comprehensive contact tracing (black dots mark the first day of the general countrywide implementation of the respective intervention in individual countries; overlaying the R_e of the robust dataset analysed).